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ISO JPEG 2000 Standards Efforts

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JPEG2000 Compression Standards

- **Part I:** specifies the minimum compliant decoder (e.g., a decoder that is expected to satisfy 80% of applications); International Standard (IS) was approved 12/30/00. This has been published by the ISO. www.jpeg.org
  - This is what NIMA will standardize for use in 90% of their applications. If you are compliant to this standard, you will be compliant to the future NSGI architecture. All NITFS 2.1 readers will be required to support the JPEG 2000 Part 1.
- **Part II:** Describes optional features and value added extensions. International Standard (IS) was approved 1/10/01.
  - There are extensions that we may wish to add from Part 2, but they will not be added until required. The main interest is multiple component compression for HSI and MSI data. Also, Trellis Coded Quantization may be of use for SAR imagery.

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JPEG2000 Compression Standards

- **Part III:** Motion JPEG 2000 with file format from MPEG 4. International Standard was approved. The compression does not take advantage of the inter-frame correlation. There is no limitation of image size or bitdepth as in MPEG 1,2, and 4.
  - This may be interesting to the Motion Image Technical Board. The Motion Board is currently reviewing this technology. We will leave it up to them to pursue
- **Part V:** Reference software: Two versions of reference software (JAVA, C++). International Standard was approved. The US has brought concerns that the reference software is currently not fully compliant to the Part 1 standard.
  - This part could be useful because it is free software, but this free software is not compliant to the current Part 1 standard. We will use the C++ version to develop example software for NIMA to distribute. Current issue is that this is not written by an American.

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Future Standards

Currently being worked standards that will be passed within the next year:

- **Part IV:** Compliance testing procedures. The IS ballot is closes by July 2002. Compliance test image and procedures are very important for the promotion of “compliant” standards and interoperability. Imagery is available on the internet.
  - Part 4 is a basis of what and how JITC will test NITFS 2.1 readers and writers for compliance. This is a very important part and NIMA may want to add test bitstreams to the ISO JPEG website once they have produced large compliance test images.
- **Part VI:** Compound document. Being developed to support compound documents (text, graphics, and images) using the Mixed Raster Content (MRC) defined in ISO 16458. Currently at FCD.
  - Probably not interested at this time. We may want to reconsider if this becomes a commercial success.

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New Work Items

- **Part 8: Security: JPSEC**
  - Security issues, such as authentication, data integrity, protection of copyright and intellectual property, privacy, conditional access, to mention a few, are among important features in many imaging applications targeted by JPEG 2000. This part of the JPEG 2000 standard intends to provide tools and solutions in terms of specifications in order to allow applications to generate, consume, and exchange SECURE JPEG 2000 bitstreams.

  - We may be interested in this, but it is focused more on copyright protection than on actual security.

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New Work Items

- **Part 9: Interactivity tools, APIs and Protocols**
  - This part would support user interaction with JPEG 2000 images by providing APIs whereby applications could exploit JPEG features and protocols whereby this interaction can occur remotely over networks.
  - Interactivity is a key component in many multimedia applications. Interactivity, in local or remote, often requires rules and syntax to for exchange of information. As an example, a thin client may wish to browse through a very large image present on a server without requiring transmission of the whole image Part 11 of JPEG 2000 intends to provide further specifications to previous JPEG 2000 parts in order to allow for flexible yet interoperable interactions.

  - This is the most important work item right now. This is the key in interoperability of JPEG 2000 tools and the key in unlocking the functionality of the JPEG 2000. This would go into something like the GIAS specifications.

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New Work Item

- **Part 10: 3-D and floating point data**
  - This part will provide a mechanism for compression and decompression of volume data. JPEG 2000 Part 1 provides encoding and decoding mechanisms for two-dimensional image data. Part 2 provides extension to multiple components via decorrelating transforms. However, there is no provision for encoding across the decorrelated components. There is only two-dimensional encoding among the decorrelated components. Therefore, this part will provide the means for encoding directly three-dimensional set of original or transformed data. The applications are to volume imagery, usually gathered by tomography to create a volume medical, biological or geological images, or to measurement data associated with a three-dimensional grid.

  - This would again be something that we could add if it becomes necessary that we store, transmit, and use volumetric data and/or floating point data. We will continue to stay in contact with this work item.

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NITFS Standards Development
JPEG 2000 Profile Status

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Profile Status

- JPEG 2000 Profile
  - Working draft 1.1 (Release December 2001)
  - Working Draft 1.3 will be release at the May BWC meeting
  - BWC working group (2 – 3 days in DC or Rochester in June)
    - Finalize the draft for comments
  - Expect Final Draft July 2002
    - Start the committee acceptance NIMA, NATO, . . .
  - The profile of what NITFS 2.1 will support and what is recommended is stable.
    - The work that will continue will mainly be associated with improvements in the document for understanding purposes.
- Developers guide
  - Working draft 1.1 (release and has not been touched)
  - Will not be updated until the profile is complete
    - Not enough funds to push 2 documents and the profile is more important

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J2K DCGS Developments

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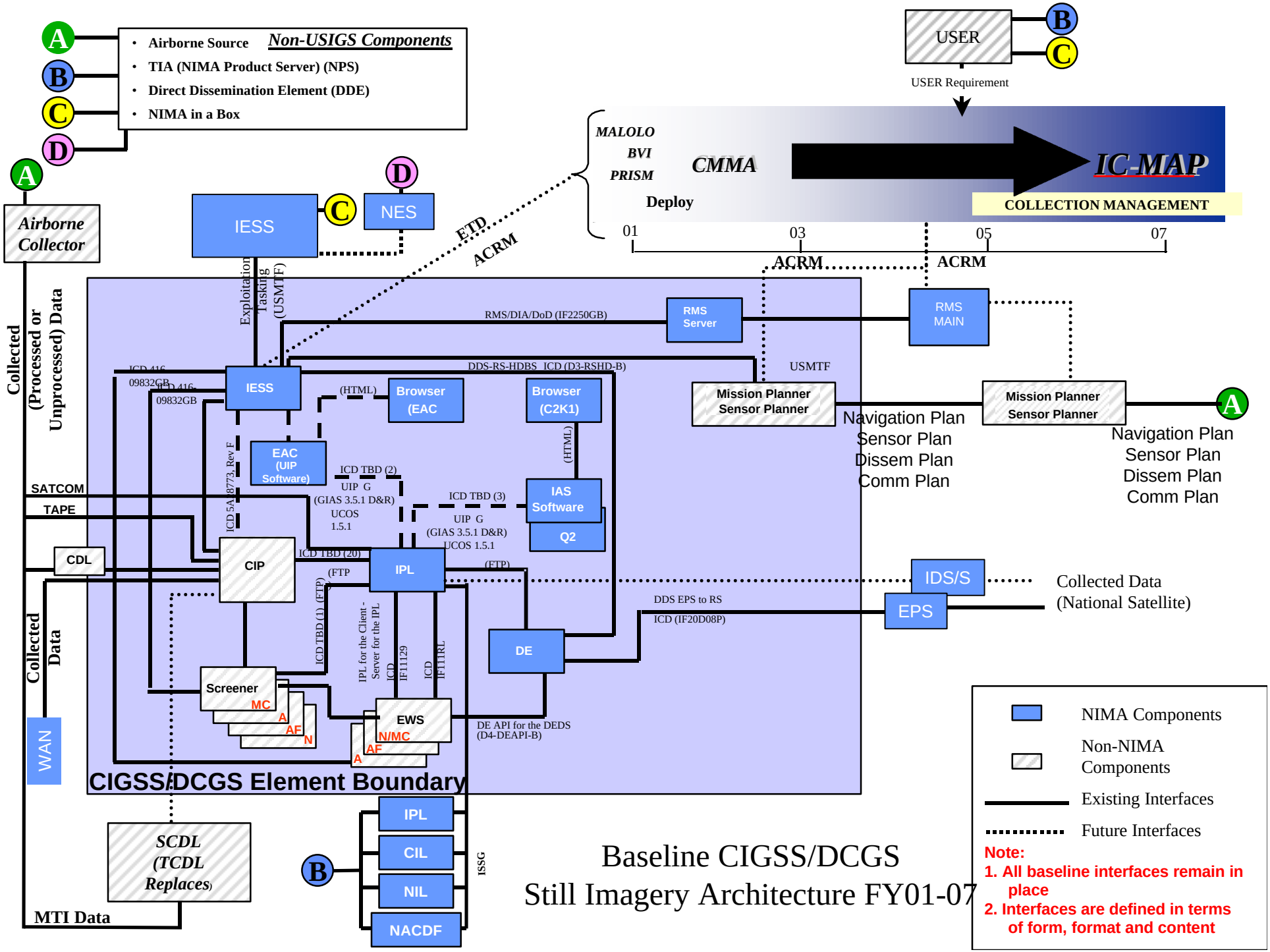
J2K DCGS Developments

- The integration and interoperability of DCGS with the NSGI is a NIMA focus.
  - NITFS and JPEG 2000 are one of the enabling technologies that will allow this to occur
- JPEG 2000 Migration
  - Developing plans of migrating DCGS to JPEG 2000 across the entire architecture
  - Assessing the impacts of the addition of JPEG 2000 to the components of the DCGS architecture
  - Assessing the cost of the addition of JPEG 2000 to the components of the DCGS architecture
- JPEG 2000 Optimization
  - Support the optimization of compression for several tactical collection systems
- JPEG 2000 Software
  - Develop open example software that can be used to support programs and developments
  - Use current JPEG 2000 Part 5 Source code to support this


A
B
C
D
Airborne Source
TIA (NIMA Product Server) (NPS)
Direct Dissemination Element (DDE)
NIMA in a Box
Non-USIGS Components
USER
USER Requirement
MALOLO
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COLLECTION MANAGEMENT
01
03
05
07
ACRM
ACRM
ACRM
ETD
Airborne Collector
IESS
NES
Exploitation Tasking (USMTF)
Collected (Processed or Unprocessed) Data
RMS/DIA/DoD (IF2250GB)
RMS Server
RMS MAIN
DDS-RS-HDBS ICD (D3-RSHD-B)
USMTF
ICD 416 09832GB
IESS
(HTML)
Browser (EAC
Browser (C2K1)
Mission Planner Sensor Planner
Navigation Plan
Sensor Plan
Dissem Plan
Comm Plan
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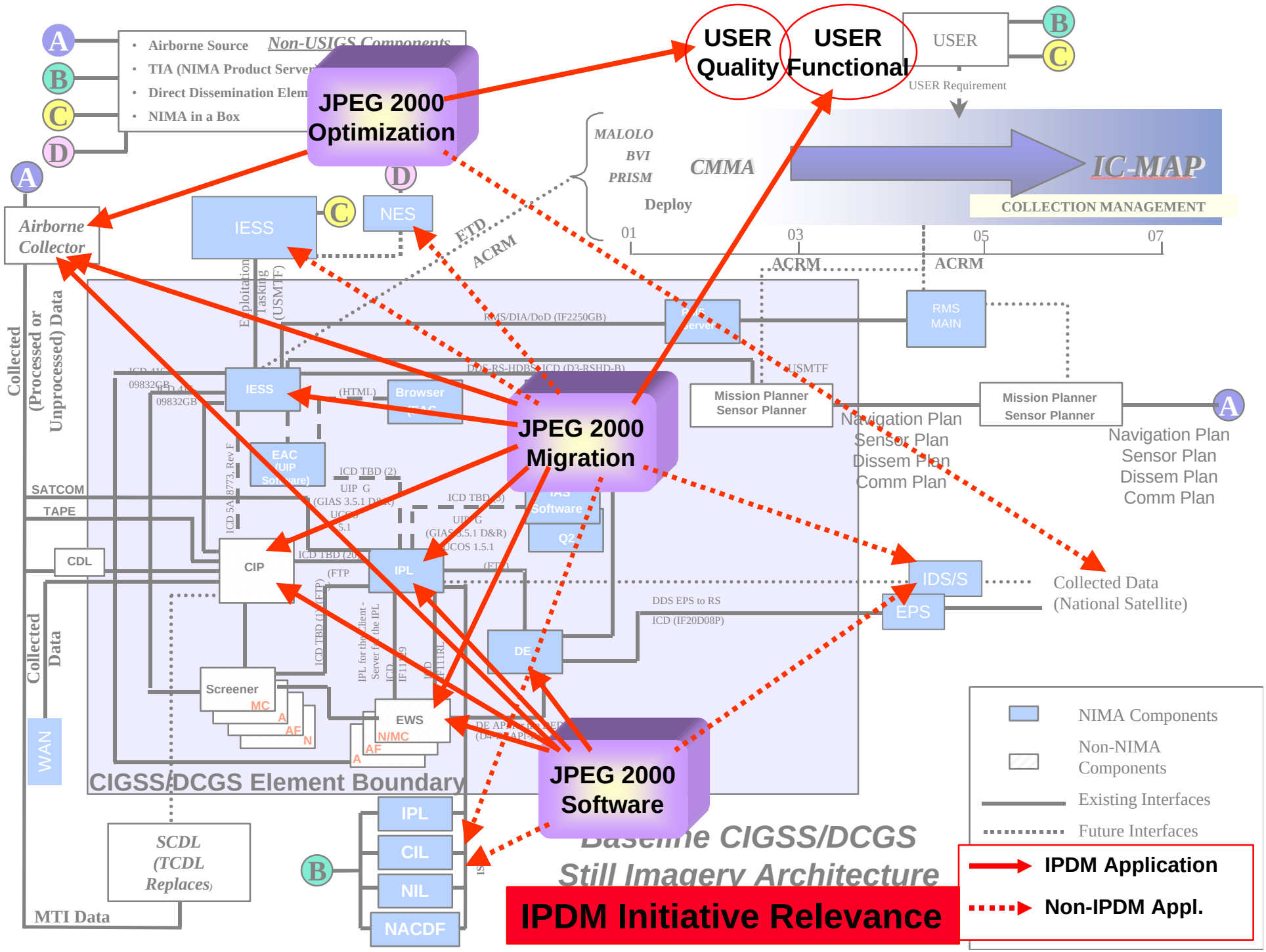
Navigation Plan
Sensor Plan
Dissem Plan
Comm Plan
EAC (UIP Software)
ICD 5A 8773, Rev F
ICD TBD (2)
UIP G
(GIAS 3.5.1 D&R)
UCOS 1.5.1
ICD TBD (3)
UIP G
(GIAS 3.5.1 D&R)
UCOS 1.5.1
IAS Software
Q2
SATCOM
TAPE
CDL
CIP
ICD TBD (20)
IPL
(FTP)
(FTP)
ICD TBD (1) (FTP)
IPL for the Client - Server for the IPL ICD IF11129
ICD IF11TRL
IDS/S
EPS
Collected Data (National Satellite)
DDS EPS to RS
ICD (IF20D08P)
DE
Collected Data
Screener
MC
A
AF
N
EWS
N/MC
AF
A
DE API for the DEDS (D4-DEAPI-B)
WAN
CIGSS/DCGS Element Boundary
SCDL (TCDL Replaces)
MTI Data
B
IPL
CIL
NIL
NACDF
ISSG
Baseline CIGSS/DCGS
Still Imagery Architecture FY01-07
NIMA Components
Non-NIMA Components
Existing Interfaces
Future Interfaces
Note:
1. All baseline interfaces remain in place
2. Interfaces are defined in terms of form, format and content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IPDM Initiative Relevance
NIMA Components
Non-NIMA Components
Existing Interfaces
Future Interfaces
IPDM Application
Non-IPDM Appl.